

POWERED BY



TI4100 GPU-24 **GROUND POWER UNIT**



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WARNING



*****SHOCK HAZARD POTENTIAL*****



IMPROPER USE/FAILURE TO FOLLOW INSTRUCTIONS IN OPERATORS MANUAL CAN RESULT IN UNIT FAILURE AND/OR POSSIBLE INJURY, OR DEATH, BY ELECTRICAL SHOCK.

THE **TI4100GPU-24** IS A MAINTENANCE FREE, SEALED UNIT

NO REPAIRS ARE AUTHORIZED.

WARRANTY WILL BE **VOID** IF

UNIT IS TAMPERED WITH.

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WARNING



*****SHOCK HAZARD POTENTIAL*****



ATTEMPTS TO OPEN OR ENTER THE INSIDE OF THIS UNIT (BY USING ANY TOOL OR DEVICE; i.e. PROBE, BORESCOPE, etc.) CAN RESULT IN UNIT FAILURE AND/OR POSSIBLE INJURY BY ELECTRICAL SHOCK. THIS UNIT IS MAINTENANCE FREE AND SHALL NOT BE OPENED OR DISASSEMBLED FOR ANY REASON.

SHIPPING HAZARDS

"NONE"

"DRY" Non-spillable, POWER CELL (battery),

No Free liquids, to leak or toxic gases.

Always protect unit from short circuit.

Return Power cells to Tesla for Recycling.

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CHAPTER 1

INTRODUCTION

1-1. GENERAL

These instructions are for use by the owner/operator. They apply to handling and operation of the TI4100GPU-24 (Turbo Start 4100) ground power unit.

1-2. WARNING, CAUTION, AND NOTE DEFINED

A warning, caution, or note is used to emphasize important and critical instructions as defined for the following conditions:

WARNING



An operating procedure, practice, etc., which, if not correctly followed, could result in personal injury or loss of life.

CAUTION



An operating procedure, practice, etc., which, if not strictly observed, could result in damage to or destruction of equipment.

NOTE

An operating procedure, condition, etc., which is essential to highlight.

1-3. DESCRIPTION

This manual contains the complete operating instructions and procedures for the TI4100GPU-24 (Turbo Start 4100) ground power unit. The Turbo Start 4100 is intended to provide DC electrical ground power for aircraft flight line and maintenance ground support operations. The unit is designed to provide 24 volt DC electrical power output for aircraft engine starting and 24 or 28.5 volts DC electrical support for ground maintenance, avionics/electrical trouble shooting and testing. The observance of procedures, limitations and performance criteria is essential to ensure peak operating efficiency and to maximize operational capabilities and life of the Turbo Start 4100 ground power unit.

1-4. INDEX

The index lists, in alphabetical order, every titled paragraph and figure contained in this manual.

1-5. ABBREVIATIONS AND SYMBOLS

Abbreviations and symbols are used within text, headings and titles. Unless otherwise indicated, the following list of abbreviations and symbols are used in this manual:

LIST OF ABBREVIATIONS AND SYMBOLS

Abbreviation	Definition
amp	Ampere
AC	Alternating Current
C	Celsius
cont	Continuous
DC	Direct Current
F	Fahrenheit
Ft	Feet
FWD	Forward
GPU	Ground Power Unit
Hr	Hour
Hz	Hertz
Kg	Kilograms
Kw	Kilowatts
°	Degree
LED	Light Emitting Diode
MAX	Maximum
MIN	Minimum
VAC	Volts, Alternating Current
VDC	Volts, Direct Current
	Explosion Hazard Potential
	Shock Hazard Potential
	Guard from moisture
	Guard from incorrect power source

1-6. FORMS AND RECORDS

NONE REQUIRED.

1-7. USE OF WORDS SHALL, SHOULD, AND MAY.

Within this technical manual the word "**shall**" is used to indicate a mandatory requirement for proper operation and warranty purposes. The word "**should**" is used to indicate a non-mandatory but preferred method of accomplishment. The word "**may**" is used to indicate an acceptable method of accomplishment.

CHAPTER 2

UNIT DESCRIPTION AND OPERATION

SECTION I. UNIT

2-1. GENERAL

The TI4100GPU-24 (Turbo Start 4100) (Figure 2-1 and 2-2) is a compact, portable and highly versatile 24/28.5 VDC electrical ground power unit. The unit incorporates a 208-240 single phase VAC to 28.5 VDC converter, a 24 volt unique (dry) power cell and an internal intelligent 208 to 240 volt AC charger to recharge the power cells. These built-in features give the Turbo Start 4100 self-sufficiency and mobility for short-term operations without AC electrical power or long term operations with AC electrical power. Short term operations rely solely on power cell output and the fast recharge rates that the unit's internal charger provides from any standard 208-240 single phase VAC electrical outlet. Longer term operations incorporate the continuous 100 amp output of the 208-240 VAC to 28.5 VDC converter, or a combination of converter and power cell output to provide 24 VDC output. The following are the unit's four (4) main operational support capabilities:

- a. 24 VDC 1500 amp peak power output for engine starting or constant (one hour) rated power output (without a 208-240 VAC power source) for short term trouble shooting and flexible flight line support ground power.
- b. 24 VDC constant (one hour) rated power output or variable high load demand output (less than one hour) with a 208-240 single phase VAC power source for extended maintenance (hangar) and routine flight line maintenance, ground support power.
- c. 28.5 VDC continuous rated (AC to DC converter) power output with a 208-240 VAC power source for hangar and routine flight line maintenance support, and avionics bench testing.
- d. Rapid recharge of the unit's power cells from any 208-240 VAC common power source. This feature eliminates the need for special recharge equipment and dedicated maintenance support man-hours.

SECTION II DESCRIPTION

2.2. GENERAL SPECIFICATIONS

WEIGHT

UNIT:	100 lbs (50.39 Kg)
DC POWER CABLE:	8.5 lbs (3.86 Kg)
AC POWER CORD:	0.4 lbs (0.18 Kg)

INPUT POWER AC

TI4100GPU-24: 208-240 Single Phase VAC 50/60 Hz 30.0 amps max.

OUTPUT POWER DC

CONVERTER:	28.5 VDC TO 100 AMPS, 24 VDC 121 AMPS AND ABOVE.
POWER CELLS:	24 VDC
PEAK OUTPUT:	1500 AMPS

POWER CELL

DRY, HIGH RATE DISCHARGE, RECHARGEABLE, MAINTENANCE-FREE

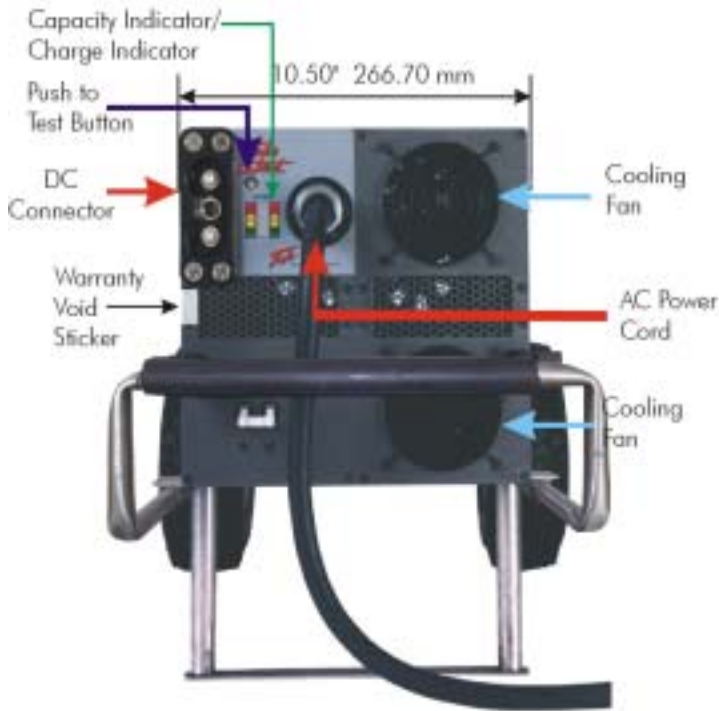
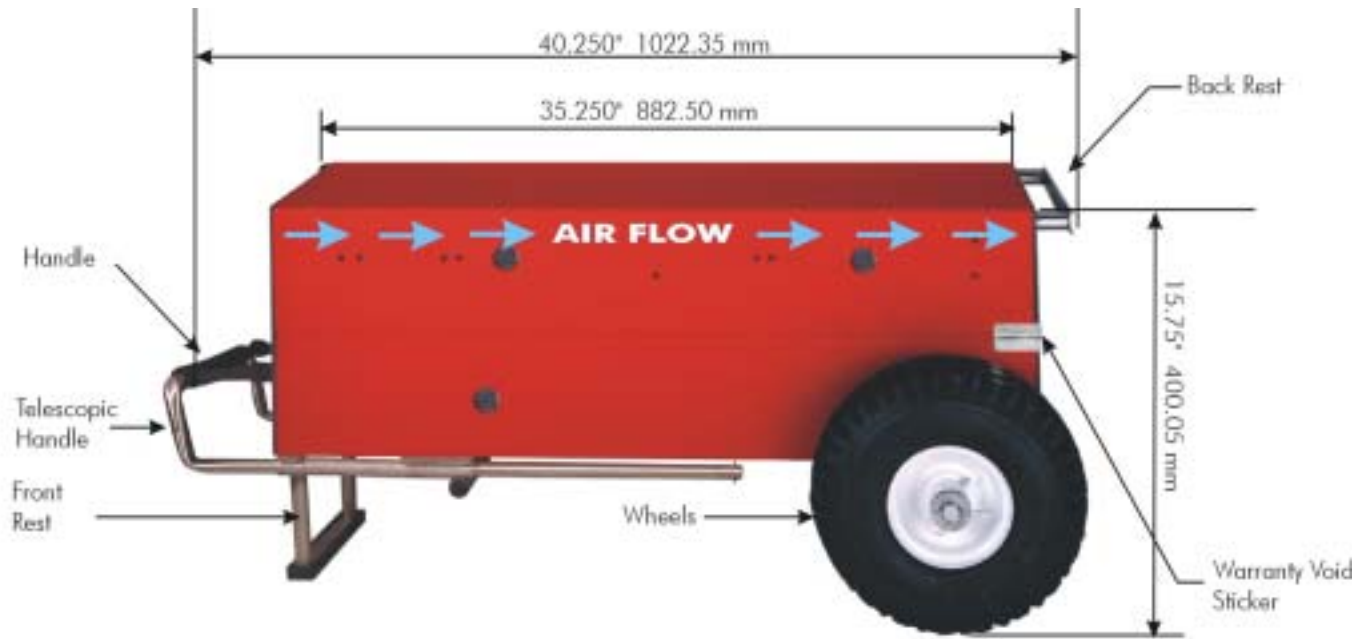
DC POWER CABLE

LENGTH: 8 FT

AIRCRAFT CONNECTOR: 3 PIN RECEPTACLE (MS25488)

AC POWER CORD: 8 Ft. 208-240 Single Phase VAC

UNIT DISCRPTION AND DEMENTIONS



CHAPTER 3

OPERATING LIMITS AND RESTRICTIONS

SECTION I. GENERAL

3-1. PURPOSE

Chapter 3 includes all important operating limits and restrictions that must be observed for proper and safe operation of the TI4100GPU-24 (Turbo Start 4100) ground power unit.

3-2. GENERAL

The operating limitations set forth in this chapter are the direct result of design analysis, testing, and operating experience. Compliance with these limitations and restrictions will ensure that owners/operators obtain maximum continued capability from the Turbo Start 4100 ground power unit.

SECTION II. OPERATIONAL RESTRICTIONS AND SAFETY LIMITS

3-3. POWER CELL RECHARGE LIMITS

Any time the unit's power cells are discharged the unit shall be recharged within 24 hours to prevent performance degradation and ensure maximum life.

CAUTION

This unit is set up to recharge off of 208-240 Single Phase 50/60 Hz VAC Power. Any other type of AC power may cause damage to the unit.

Unit's power cells may be damaged if recharged by NiCad or Lead Acid-type battery chargers. Power cells should only be charged by either the TURBO START internal charger and the AC power cord furnished with the equipment, or when connected aircraft external DC power receptacle.

3-4. 208-240 VAC CHARGER AND AC TO DC CONVERTER LIMITS

The unit is designed with a single point AC receptacle for external power to operate both the internal charger and converter. The units AC voltage range can be factory set from **208 to 240 VAC SINGLE PHASE 30 AMPS MAX at 50/60 Hz** depending upon customer requirements. The AC power cord provided with the unit is the mechanism that ensures the specified AC power source is properly supplied to the unit (see paragraph 3-5). Use no others

INTERNAL CHARGER: NO LIMIT AC power cord can remain connected when power cells are fully charged. When the power cells are fully charged the unit's intelligent charger will go to a standby mode, monitor the power cells state of charge, and only charge the power cells to ensure they stay at maximum capacity.

INTERNAL AC TO DC CONVERTER: LIMITED (see paragraph 3-6, 3-8 and 3-10). AC power cord does not have to be disconnected when converter power output is no longer required. Once DC power demand is terminated the unit's intelligent charger will remain on line to ensure power cells are charged to maximum capacity.

CAUTION



Unit will be damaged if unapproved AC power is applied.

3-5 AC POWER CORD LIMITS

The AC power cord governs which AC power source the unit is set to operate from. The Turbo Start 4100 is supplied with a single customer specified AC power cord.

WARNING



*****SHOCK HAZARD POTENTIAL*****



Failure to use proper grounding can cause a potential shock hazard! In different countries, the 240 VAC 50/60 Hz power cord may require the use of a plug adapter to achieve plug style compatibility for 240 VAC 50/60 Hz operation. Use only adapters with proper grounding mechanism.

3-6. ONE (1) HOUR RATE, 24 VDC CONSTANT OUTPUT

23 amp hour (without AC power connected), power cell output.

(see Figure 5-2)

123 amp hours (with AC power connected), both power cell and AC to DC converter output.

NOTE

If power output is greater than rated amp hour rate, power cell discharge rate will increase correspondingly.

3-7. RATED PEAK OUTPUT (ENGINE STARTING)

1500 peak amps at 25°C (77°F) (See Figure 5-3).

3-8. CONTINUOUS OUTPUT RATE, 28.5 VDC CONSTANT OUTPUT

100 amp hours (with AC power connected)

NOTE

If current demand exceeds 100 amps, converter output voltage will drop below 28.5 VDC and two or more LED status indicator bars will illuminate. If all LED status indicator bars illuminate, both the converter and power cells are supplying 24 VDC power output (see paragraph 3-4 and 4-7.4.).

3-9. ENGINE STARTING POWER

Operators should always ensure the unit is charged above 80% prior to ground support engine starting. However, circumstances may exist during use where unit recharge is not readily available and immediate external engine starting power is required. The following provides minimum states of charge necessary to provide ample power for an efficient engine start under specific current load demands.

<u>ENGINE START CURRENT LOAD DEMAND</u>	<u>MINIMUM CHARGE</u>
Under 650 peak starting amps	40% charged
650-850 peak starting amps	50% charged
850-1000 peak starting amps	60% charged
1000-1200 peak starting amps	70% charged
1200-1500 peak starting amps	80% charged

3-10. TEMPERATURE

Temperatures refer to the unit's cold/heat soaked temperature. A unit's cold/heat soaked temperature shall be established by the ambient temperature that a unit is exposed to for one (1) hour or more. If unit's cold/heat soaked temperature exceeds operating temperature range, unit shall be stabilized prior to operation as follows: COLD SOAKED, warmed for a minimum of 3 hours above +10C^o (+41^oF) or 2 hours above +20C^o (+68^oF); WARMED SOAKED, cooled for 1 hour below +38C^o (+100^oF).

Operating range:

without AC power -40C^o (-40^oF) TO +60C^o (+140^oF)

with AC Power -30C^o (-22^oF) TO +50C^o (+124^oF)

Storage range:

-60C^o (-76^oF) TO +60C^o (+140^oF)

(CONTINUED ON NEXT PAGE)

CAUTION

Unit may be damaged if operated when unit's cold or heat soaked temperature exceed the specified limit. If unit is operated when cold or heat soaked temperature limit is exceeded, a full functional check should be accomplished prior to continued use.

NOTE

If unit should overheat, an over-temperature sensor will shut down 208-240 VAC functions (charger and converter) until unit cools to normal operating temperatures.

3-11. ENVIRONMENTAL

Operating any electrical equipment in the presence of moisture creates possible safety hazards and/or potential for equipment damage. Every effort has been made, within the scope of existing technology to prevent foreseeable safety hazards and make the Turbo Start 4100 moisture resistant to prevent damage or failure. If the Turbo Start 4100 is exposed to moisture, preventive measures and precautions shall be taken to:

- a. prevent accumulation of moisture on AC and DC connectors/receptacles

- b. minimize moisture entering FWD inlet and AFT outlet cooling fan vent ports

The limits and operational constraints listed below shall apply for the following environmental (weather) conditions:

- | | |
|------------------------------|-------------------------------------|
| <u>Heavy or steady rain:</u> | OPERATION NOT RECOMMENDED |
| <u>Light rain, drizzle:</u> | NO CONVERTER OR CHARGER 208-240 VAC |
| <u>fog, snow or sleet:</u> | POWER SHALL BE APPLIED. |

Unit inlet and outlet vent ports shall be covered from exposure. Unit shall be kept horizontal.

WARNING



*****SHOCK HAZARD POTENTIAL*****



Severe injury, or Death, from electrical shock is possible when personnel and/or Turbo Start 4100 are wet during use and when 208-240 VAC power is being supplied to unit.

CAUTION



Damage may occur if unit is operated after exposure to moisture (rain, drizzle, fog, sleet or snow) or moisture contamination is suspected. DO NOT USE until unit's exterior and receptacles are dried. Operation shall be restricted to use without 208-240 power cord. DO NOT CONNECT 208-240 VAC power cord until unit has been dried for a MINIMUM of one (1) hour, prior to use.

Blowing sand or dust: Minimize exposure to sand and dust when 208-240 AC power is used. Unit shall be kept horizontal during use.

3-12. OPERATING POSITION

Without 208-240 VAC power cord: Horizontal or vertical.

With 208-240 VAC power cord: Horizontal only.

Horizontal only, for proper unit ventilation, when 208-240 VAC line cord is plugged in and exhaust fan is running.

CAUTION

Unit may be damaged if blown over by propeller, rotor or jet wash, or accidentally knocked over. Unit should be kept horizontal during use.

CAUTION

Unit damage may occur if inlet and outlet vent ports are obstructed and/or cooling air flow is restricted.



Side Vents



Front Vent/Cooling Fan



Back Vent/Cooling Fan

3-13. UNIT OPERATION DURING AIRCRAFT FUELING/DEFUELING

Power output is restricted to 24 VDC power cell output only. DO NOT CONNECT 208-240 VAC POWER SUPPLY. 208-240 VAC power (charger or AC-DC converter) functions of unit shall not be operated during any aircraft fuel handling operation.

WARNING



*****FIRE/EXPLOSION HAZARD POTENTIAL*****



Severe injury, or Death, may occur from fire or explosion, as a result of electrical sparks produced near fuel vapors.

CHAPTER 4

OPERATING PROCEDURES

SECTION I. UNIT OPERATION

4-1. GENERAL

Correct operation of the TI4100GPU-24 (Turbo Start 4100) includes both pre-use and operational checks of the unit. Knowledge of the operating limits, restrictions, performance, unit capabilities and functions is fundamental to correct and safe operation. The operator shall ensure compliance with the instructions in this manual that affect operational safety and the warranty of the unit.

4-2. OPERATING LIMITS AND RESTRICTIONS

The minimum, maximum and normal operating ranges result from careful engineering and evaluation of test data. These limitations must be adhered to during all phases of operation. Refer to Chapter 3, Section II, OPERATING LIMITS AND RESTRICTIONS, for detailed information.

4-3. PERFORMANCE

Refer to Chapter 5, PERFORMANCE DATA to determine the capability of the Turbo Start. Consideration must be given to changes in performance resulting from variations in ambient temperature, mode of operation, state of charge (with or without 208-240 VAC power), and aircraft DC bus system inefficiency (voltage drops).

SECTION II. OPERATING PROCEDURES

4-4. OPERATING PROCEDURES

This section deals with normal procedures, and includes all steps necessary to ensure safe and efficient operation of the TI4100GPU-24 (Turbo Start 4100). As experience is gained with the Turbo Start 4100, the user will be able to maximize the unit's unique capabilities to enhance the flexibility of aircraft maintenance and support operations.

NOTE

When the TURBO START 4100 is not in use, it should always remain plugged into a suitable AC power source to insure operational readiness at all times. REMEMBER, when the AC line cord is plugged in, the unit must be placed in the horizontal position to allow the cooling fan to operate properly!

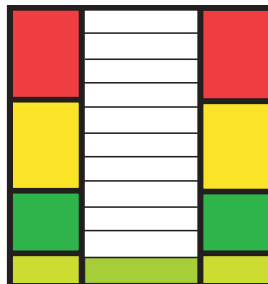
4-5. BEFORE OPERATION CHECK

1. CHECK UNIT FOR STATE OF CHARGE- Ensure power unit is connected to a suitable AC power source (208-240 Single Phase VAC 30AMP max outlet). The LED status indicator should show a single green bar (last LED bar) to indicate the unit's power cells are fully charged.

NOTE:

A full charge is indicated by Either a steady lighted green bar or a blinking green bar at the bottom of the bar graph column The fan will also exhibit ratcheting but will not come on when the unit is fully charged.

STATUS



2. CHECK UNIT FOR EVIDENCE OF DAMAGE - Check for dents, punctures, case distortion or misalignment, cracked or loose connectors, and that cooling fan is functioning.

CAUTION

REMEMBER, when the AC line cord is plugged in, the unit must be placed in the horizontal position to allow the cooling fan to operate properly!

Unit may overheat if cooling fan fails. Do not operate if cooling fan fails. (More than one green bar present on bar graph)



Front Vent/Cooling Fan



Back Vent/Cooling Fan

3. CHECK DC POWER CABLE/CONNECTORS FOR DAMAGE - Check cable for cuts, chafing or evidence of being crushed. Check connectors for cracks, cuts, distortions, excessive wear, broken/loose fasteners or loose cable attachment.

4-6. 24 VDC GROUND POWER (NO 208-240 VAC POWER SUPPLY) ENGINE STARTING OR DC SYSTEM POWER

1. TRANSPORT UNIT - The Turbo Start 4100 is easily transported using the wheels that are incorporated into the unit. The unit is engineered to be pushed rather than pulled.

2. CONNECT DC POWER CABLE TO UNIT - Ensure power cable connector is fully seated into unit's connector. Set the unit down horizontally ensuring vent ports are unblocked.

3. CONNECT DC POWER CABLE TO AIRCRAFT - Ensure ground power cable connector is fully seated into aircraft ground power receptacle. DC bus power should come on and aircraft volt meter should indicate 24 VDC to 23.5 VDC (23 VDC minimum).

4. ENGINE STARTING - Check power cable for security and correct installation prior to engine start. Follow ground power engine starting procedure as specified in aircraft operators manual.

5. REMOVING DC POWER SUPPLY FROM AIRCRAFT

- a. Switch the ON/OFF switch to the OFF position
- b. Remove DC power cable GPU connector from aircraft.
- c. Remove DC power cable connector from Turbo Start (if necessary).

4-7. 24 VDC GROUND POWER (WITH 208/240 VAC POWER) SYSTEM HIGH POWER DEMAND (101 amps and above) OR ENGINE STARTING.

1. TRANSPORT UNIT - The Turbo Start 4100 is easily transported using the wheels that are incorporate into the unit. The unit is engineered to be pushed rather than pulled.
2. CONNECT AC POWER CORD TO UNIT - Make sure that the On/Off switch is in the Off position. Ensure 208-240 Single Phase VAC 30AMP power cord is properly connected to an approved AC power supply. Unit shall be in Horizontal position to ensure unit's vent ports are free from blockage. After approximately 5-8 seconds, unit's LED status indicator will illuminate indicating power cells state of charge. Cooling fan will operate. Ensure LED status indicator and cooling fan are operational prior to continuing to step 3.

NOTE

THE ON/OFF SWITCH CONTROLS THE AC POWER INPUT. IT DOES NOT CONTROL THE DC POWER OUTPUT. IF YOU PLUG THE UNIT INTO AN AIRCRAFT WITH THE AC ON/OFF SWITCH IN THE OFF POSITION, THE UNIT WILL STILL PROVIDE 24VDC POWER TO THE AIRCRAFT.

3. CONNECT DC POWER CABLE TO UNIT - Ensure power cable connector is fully seated into unit's receptacle.
4. CONNECT DC POWER CABLE TO AIRCRAFT - Connect to aircraft ground power receptacle. DC bus power should come on and aircraft volt meter should indicate 27.5 VDC to 23.5 VDC (23 VDC minimum).
5. MOVE THE ON/OFF SWITCH TO THE ON POSITION - After approximately 2-3 seconds, the unit's LED bar status indicator will illuminate, indicating the power cells state of charge. The cooling fans will operate. Ensure the LED status indicator and cooling fans are operational. At this time the unit can provide 100 amps at 28.5 VDC. If the current demand is above 100 amps, the output voltage will decrease and two or more LED status indicator bars will illuminate.

NOTE

When all LED status indicator bars illuminate, both the converter and power cells are supplying 24 VDC power output for current demands above 101 amps (see paragraph 3-4).

6. ENGINE STARTING - UNPLUG AC POWER CORD BEFORE STARTING ENGINE WITH TURBO START. (see paragraph 4-6.). Prior to engine start, ensure power cell charge is sufficient to provide an efficient engine start (see paragraph 3-7).
7. REMOVING DC POWER SUPPLY FROM AIRCRAFT
 - a. Switch the ON/OFF switch to the OFF position
 - b. Remove DC power cable GPU connector from aircraft.
 - c. Remove DC power cable connector from Turbo Start (if necessary).

4-8 28.5 VDC GROUND POWER (WITH 208/240 VAC POWER) SYSTEM LOW POWER DEMAND (100 amps or less).

1. TRANSPORT UNIT - The Turbo Start 4100 is easily transported using the wheels that are incorporated into the unit. The unit is engineered to be pushed rather than pulled.
2. CONNECT AC POWER CORD TO UNIT - Make sure that the On/Off switch is in the Off position. Ensure 208-240 Single Phase VAC 30AMP power cord is properly connected to an approved AC power supply. Unit shall be in Horizontal position to ensure unit's vent ports are free from blockage. After approximately 5-8 seconds, unit's LED status indicator will illuminate indicating power cells state of charge. Cooling fan will operate. Ensure LED status indicator and cooling fan are operational prior to continuing to step 3.

NOTE

THE ON/OFF SWITCH CONTROLS THE AC POWER INPUT. IT DOES NOT CONTROL THE DC POWER OUTPUT. IF YOU PLUG THE UNIT INTO AN AIRCRAFT WITH THE AC ON/OFF SWITCH IN THE OFF POSITION, THE UNIT WILL STILL PROVIDE 24VDC POWER TO THE AIRCRAFT.

3. CONNECT DC POWER CABLE TO UNIT - Ensure power cable connector is fully seated into unit's receptacle.
4. CONNECT DC POWER CABLE TO AIRCRAFT - Connect to aircraft ground power receptacle. DC bus power should come on and aircraft volt meter should indicate 27.5 VDC to 23.5 VDC (23 VDC minimum).
5. MOVE THE ON/OFF SWITCH TO THE ON POSITION - After approximately 2-3 seconds, the unit's LED bar status indicator will illuminate, indicating the power cells state of charge. The cooling fans will operate. Ensure the LED status indicator and cooling fans are operational. At this time the unit can provide 100 amps at 28.5 VDC. If the current demand is above 100 amps, the output voltage will decrease and two or more LED status indicator bars will illuminate.
7. *REMOVING DC POWER SUPPLY FROM AIRCRAFT*
 - a. Switch the ON/OFF switch to the OFF position
 - b. Remove DC power cable GPU connector from aircraft.
 - c. Remove DC power cable connector from Turbo Start (if necessary).

4-9 POWER CELL RECHARGE

1. CONNECT AC POWER CORD TO UNIT - Unit shall be in horizontal position to ensure unit's vent ports are free from blockage. - Ensure 208-240 VAC power cord is properly connected to an approved AC power supply. After approximately 5-8 seconds, ensure unit's LED status indicator illuminates indicating power cell state of charge and cooling fan is operating.

CAUTION

Unit may overheat if cooling fan fails.

Do not operate if cooling fan fails.



Front Vent/Cooling Fan



Back Vent/Cooling Fan

2. CHECK FOR FULL CHARGE INDICATION - After 30 minutes, LED charge indicator should show a single steady or flashing green LED bar when fully charged, the last LED bar. AC power may be left connected to unit when power cells are fully charged.

NOTE

Under a full charge, two things will be observable with the unit. A non-blinking lighted green bar or a blinking green bar at the bottom of the bar graph, both indicate a full charge. Also the fan will display ratcheting but not come on when the unit is fully charged.

SECTION III.

FUNCTIONAL CHECK PROCEDURES

4-10. FUNCTIONAL CHECK PROCEDURES

This section deals with normal functional check procedures, and includes all steps necessary to ensure the Turbo Start 4100 is functioning within specific operational parameters prior to operational use. As users gain experience with the Turbo Start 4100, they will incorporate these functional checks as a routine practice.

4-11. REQUIRED EQUIPMENT FOR FUNCTIONAL CHECK.

FLUKE OR EQUIVALENT TYPE DIGITAL MULTIMETER.

4-12. DC FUNCTIONAL CHECK.

1. CHECK UNIT FOR EVIDENCE OF DAMAGE - Check for dents, punctures, case distortion or misalignment, cracked or loose connectors. If no damage is evident proceed to step two.

IF DAMAGE IS EVIDENT contact distributor or manufacturer.

2. ENSURE UNIT IS NOT PLUGGED INTO 208-240 VDC. Unplug AC power if plugged in.

3. CHECK UNIT INTERNAL RESISTANCE (TEST FOR SHORTS) - Better than 10 Megohms. Ensure no short exists.

Negative (-) DC receptacle terminal and unit case.

Positive (+) DC receptacle terminal and unit case.

4. CHECK DC VOLTAGE READING AT DC RECEPTACLE TERMINALS.

24 to 25.5 VDC depending on state of charge.

5. PLUG IN 208-240 POWER CORD.-Ensure power unit is connected to a suitable AC power source 208-240 Single Phase 50/60 Hz.

6. CHECK UNIT FOR STATE OF CHARGE - *Unit shall be in horizontal position to ensure unit's vent ports are free from blockage.* After approximately 5-8 seconds, unit LED status indicator shall illuminate indicating power cell state of charge. Ensure LED status indicator and cooling fan are operational. Prior to continuing to step 7, the LED status indicator should show a single green bar (last LED bar) to indicate the unit's power cells are fully charged. Also under full charge the fan will ratchet but not enable.

NOTE

Under a full charge, the last green LED bar may blink. This does not indicate a malfunction. A non-blinking lighted green bar or a blinking green bar at the bottom of the LED column, both indicate a full charge.

7. CHECK DC VOLTAGE READING AT DC RECEPTACLE TERMINALS. Ensure power cells are fully charged (see step 6.)

28.5 (+-0.57 VDC) with power cells at full state of charge.

8. FUNCTIONAL CHECK COMPLETE - Unit should remain plugged in to AC power until required for use.

CHAPTER 5

PERFORMANCE DATA

SECTION 1. INTRODUCTION

5-1. PURPOSE

This chapter provides performance data for the TI4100GPU-24 (Turbo Start 4100). Continual reference to this information will enable the user to obtain maximum performance, utilization and service life from the Turbo Start. Although maximum performance is not always required, regular referral to this chapter is recommended for the following reasons:

- a. To generate knowledge of unit's performance margins to enable the operator to make sound judgment when unexpected conditions or alternate operational requirements are encountered.
- b. To enable the user to readily recognize situations requiring maximum performance.
- c. To gain experience in accurately estimating the effects of variables for which data is not presented.
- d. To help the operator determine if an aircraft system malfunction exists by comparing actual performance with expected performance.

NOTE

The information provided in this chapter is primarily intended for operational planning and is most useful when planning operations under unfamiliar conditions or environmental extremes. The data may also be used to establish local operating procedures and to ensure unit's operational life is maximized.

5-2. GENERAL

The data presented covers the maximum range of conditions and performance that can reasonably be expected. In each area of performance, the effects of temperature and DC electrical load demand relating to the ground power support requirements are presented. Wherever practical, data is presented conservatively. However, NO GENERAL CONSERVATISM HAS BEEN APPLIED. All performance data presented is within the applicable limits of the Turbo Start.

SECTION II

DATA CRITERIA

5-3 DATA BASIS

The type of data used is indicated at the bottom of each performance chart under DATA BASIS. The applicable report and date of the data are also given. The data provided generally are based on one of three categories:

- a. *Derived From Actual Controlled Testing.* Controlled test data obtained on a similar unit type.
- b. *Calculated Data.* Data based on tests, but not on a similar unit type placed under a controlled test.
- c. *Estimated Data.* Data based on estimates using rules of physics, mathematics, and electrical engineering principles and concepts, but not verified by tests.

5-4. SPECIFIC CONDITIONS

The data presented are accurate only for specific conditions listed under the title of each chart or graph. Variables for which data are not presented, but which may affect that phase of performance, are discussed in associated text. Where data are available or reasonable estimates can be made, the amount that each variable affects performance will be given.

5-5. GENERAL CONDITIONS

In addition to the specific conditions, the following general conditions are applicable to the performance data.

- a. *Variation in Aircraft.* Power demand differences between individual aircraft of the same make and model are known to exist due to variations in DC electrical system efficiency. These differences, however, are considered insignificant and are not individually accounted for.
- b. *Ground Support and Aircraft Instrument Variations.* The data shown in the performance charts do not account for instrument tolerance differences or inaccuracies.

5-6. DEFINITIONS OF ABBREVIATIONS

Unless otherwise indicated, the abbreviations defined in Chapter 1 will be applicable to all charts and graphs in this chapter.

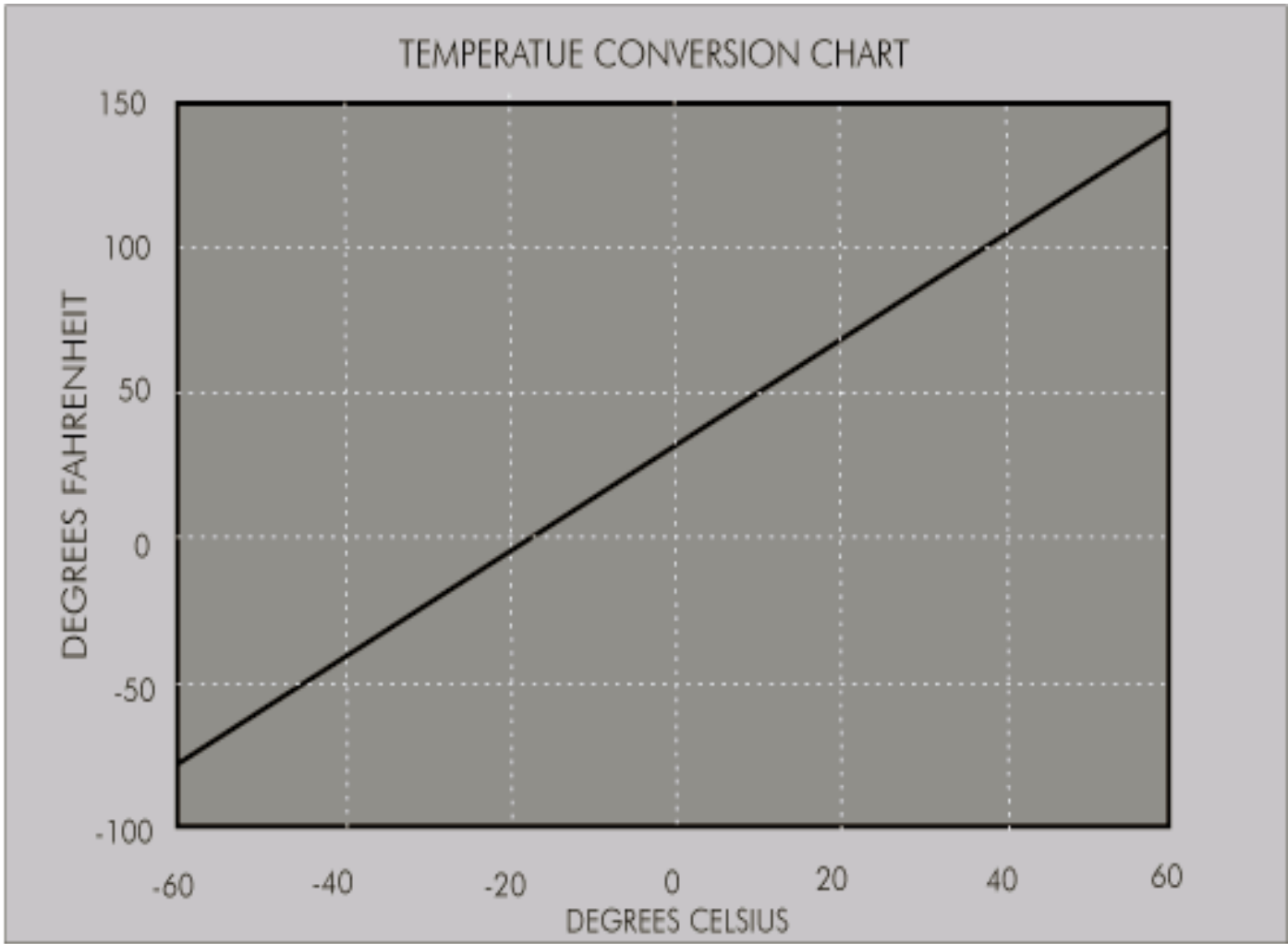


FIGURE 5-1

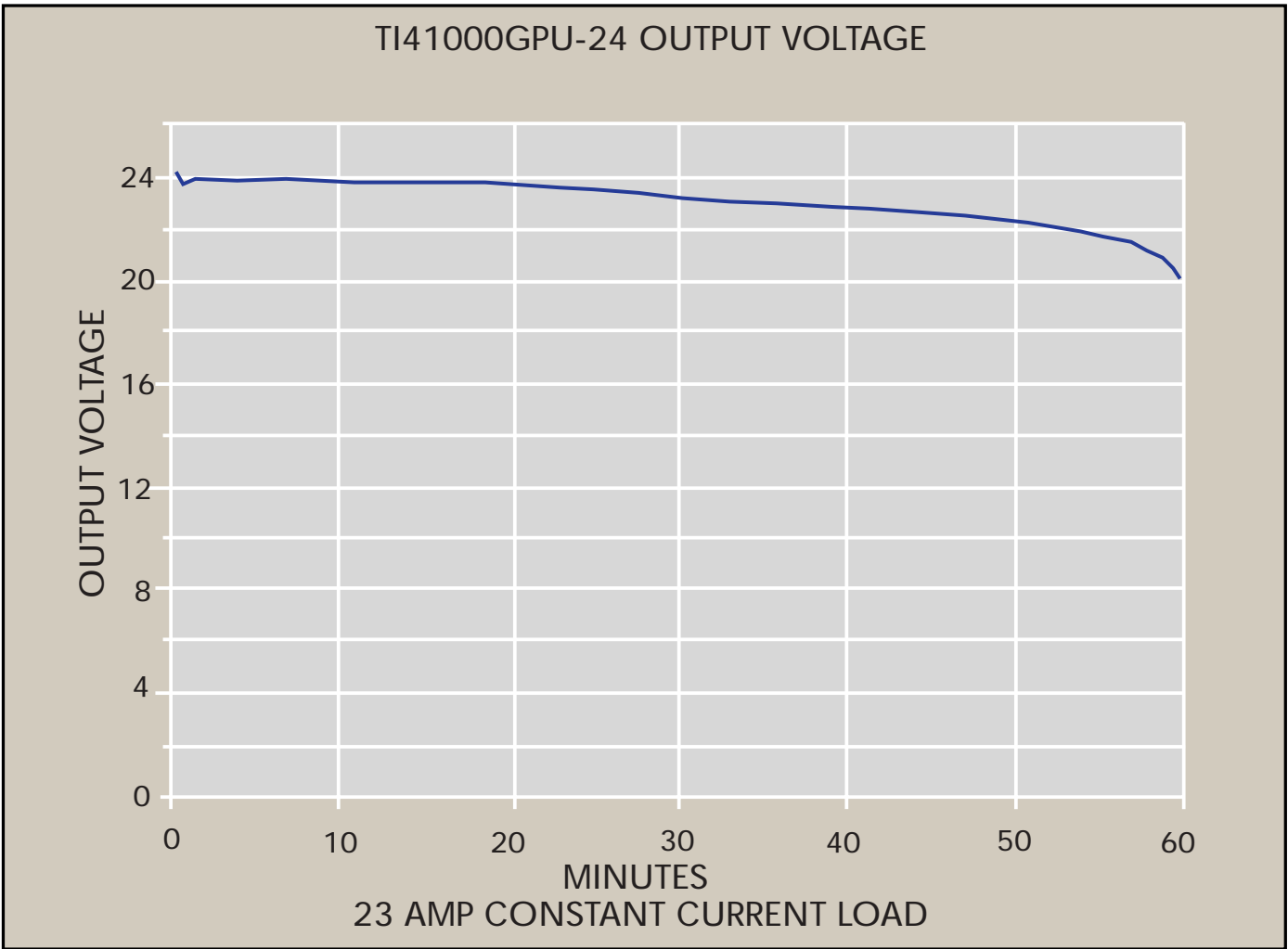
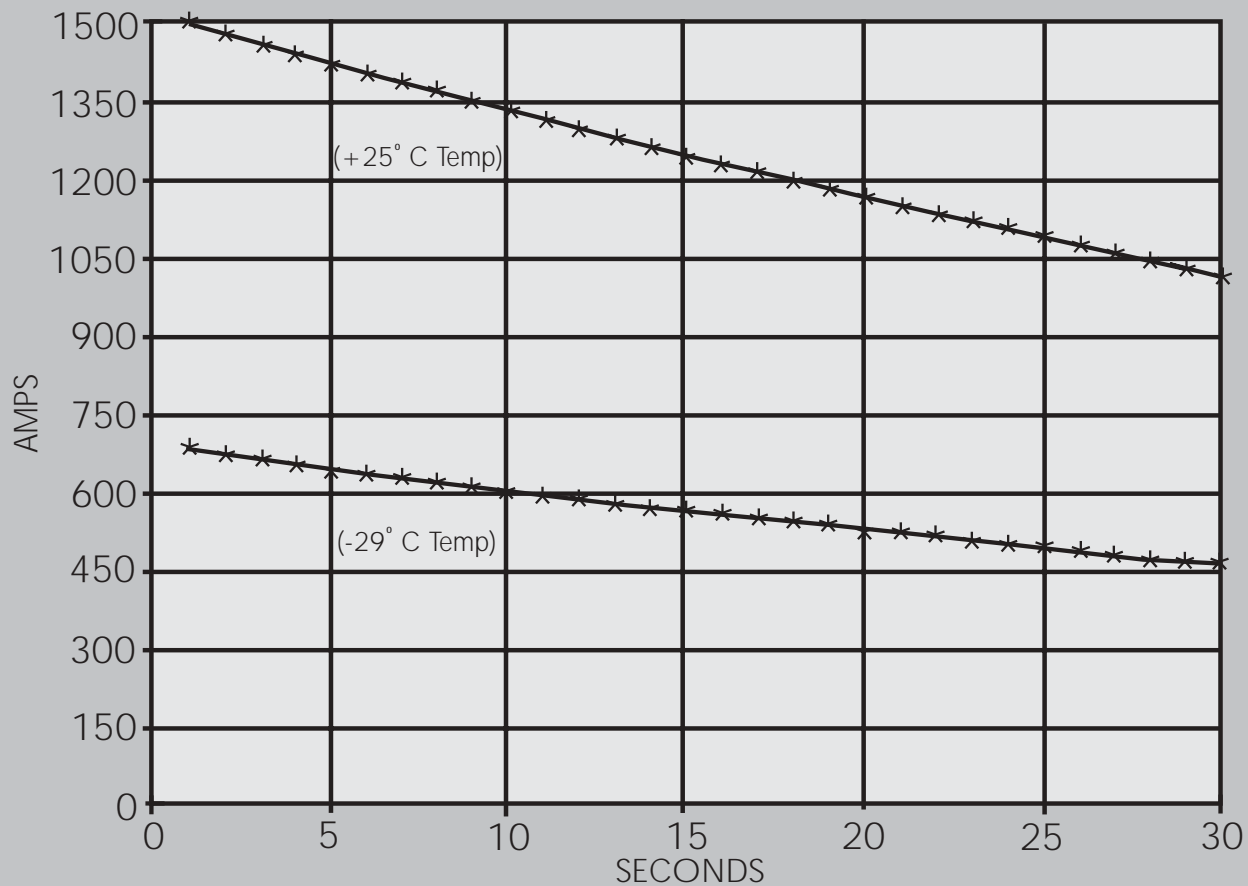


FIGURE 5-2

MAXIMUM OUTPUT CURRENT



Calculations based on actual test data at Pratt-Whitney Canada on 30 March 1992.

FIGURE 5-3

CHAPTER 6

CARE AND MAINTENANCE

SECTION I. UNIT CARE

6-1. GENERAL



Although the TI4100GPU-24 (Turbo Start 4100) has been ruggedized and made weather resistant within the scope of unit's intended use, it is essential that good general care be taken to maintain unit in good operating condition and to maximize unit's operational life.

6-2. AFTER USE - Unit should be protected from the environmental elements and man made hazards. Ideally unit should be secured in a building or shed. Most importantly, unit shall be fully covered if stored exposed to environmental elements.

1. KEEP UNIT RECEPTACLES AND OUTER CASE CLEAN - wipe with dry cloth.
2. KEEP FOREIGN OBJECTS OUT OF UNIT - Cover unit to prevent foreign objects, water, and dirt from entering vent ports and receptacles.
3. KEEP FROM PROLONGED EXPOSURE TO EXTREMELY DAMP ENVIRONMENTS

Cover unit to prevent migration of moisture. If unit is operated in extremely damp environments unit should be kept in an environmentally controlled building.

4. KEEP UNIT PLUGGED INTO AC POWER SUPPLY WHEN NOT IN USE. To maximize life of power cells and to ensure unit is always ready for use, unit should remained plugged in to AC power when not in use. NEVER LET DISCHARGED UNIT SIT FOR MORE THAN 24 HOURS WITHOUT FULLY RECHARGING POWER CELLS.
5. PROTECT DC POWER CABLE AND AC POWER CORD FROM DAMAGE - Prevent from being cut, gouged, crushed, dragged or otherwise abused.

SECTION II.

MAINTENANCE

6-3. MAINTENANCE OF UNIT - The Turbo Start 4100 is a maintenance-free unit, no repairs are authorized. Warranty will be **void** if unit is tampered with. If unit fails to operate contact Manufactures Warranty Claim (see unit warranty).

Warranty Void Sticker/Do not Remove



Warranty Void Sticker/Do not Remove



Chapter 7

Push To Test Modification

General Information And Operation

7-1. General

THIS MODIFICATION HAS BECOME STANDARD EQUIPMENT FOR EACH OF OUR UNITS. BOTH MILITARY AND CIVILIAN CLIENTS HAVE FOUND THIS MODIFICATION TO BE CRITICAL TO THEIR OPERATION. THE PUSH TO TEST BUTTON IS USED TO INDICATE THE CAPACITY OF THE POWER CELLS WITHOUT APPLYING AC INPUT POWER. IT ALLOWS THE END USER TO CHECK THE STATUS OF THE POWER CELLS. THIS LETS THE OPERATOR KNOW IF THERE IS ENOUGH POWER TO PERFORM ANOTHER ENGINE START, OR IF THE UNIT HAS TO BE RETURNED TO AC POWER TO ALLOW IT TO RECHARGE.

7-2. OPERATION

- 1) MAKE SURE THAT YOU WAIT AT LEAST 2 MINUTES AFTER AC POWER IS APPLIED, OR DC POWER IS EXTRACTED FROM THE UNIT, BEFORE YOU DEPRESS THE PUSH TO TEST BUTTON. THIS WILL ENSURE A CORRECT READING.
- 2) WITHOUT AC POWER INPUT OR DC POWER OUTPUT, SIMPLY DEPRESS THE PUSH TO TEST BUTTON ON THE FACE PLATE AND HOLD FOR APPROXIMATELY 15 SECONDS.
- 3) AT THIS TIME THE LED BAR GRAPH SHOULD LIGHT UP INDICATING THE STATUS OF THE POWER CELLS.
- 4) THE FAN SHOULD ALSO OPERATE AT THIS TIME. IF YOU DO NOT HEAR THE FAN RUNNING, STOP DEPRESSING THE BUTTON AND CHECK FOR ANY OBSTRUCTIONS TO THE FAN.
- 5) NEVER DEPRESS THE PUSH TO TEST BUTTON WHILE THE UNIT IS PLUGGED INTO AC POWER FOR RECHARGE, OR PLUGGED INTO AIRCRAFT FOR DC POWER OUTPUT.
- 6) NEVER DEPRESS THE PUSH TO TEST BUTTON FOR MORE THAN 30 SECONDS. THIS MAY CAUSE A TEMPERATURE SENSOR TO TEMPORARILY DISRUPT PUSH TO TEST FUNCTION. (IF THIS SENSOR IS TRIPPED, ALLOW TEN MINUTES FOR UNIT TO COOL BEFORE OPERATING PUSH TO TEST BUTTON.)



STATUS

R		0
Y		1/2
G		OK

Chapter 8

ON/OFF SWITCH

General Information And Operation

7-1. General

The TI4100GPU-24 comes equipped with an On/Off switch on the face plate, This switch controls AC power input only, It does not control the DC output power to the aircraft, Whenever the unit is plugged into an aircraft, it is supplying DC power, The ON/OFF switch located on the face plate does not have any control on the DC output power function

8-2. OPERATION

- 1) Place the On/Off switch in the Off position.
- 2) Plug the unit into 208/240 single phase 30 AMP AC power.
- 3) Connect the DC cord to the Aircraft or vehicle. (At this time the unit will be providing 24 VDC Power)
- 4) Place the On/Off switch to the on position. After 2-3 seconds, The led bar graph should light and the fans should begin to operate.
- 5) If the fans and led bar graph do not operate, than check the AC outlet for power.

NOTE

The power cells will only recharge while the On/Off switch is in the on position. The On/Off switch does not control the DC output power.

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